

A cutting-edge railway engineering



Antoine Mouchart

Director of Engineering, Offers & Projects



The MASTERIS engineering department, with its positioning at the heart of one of the largest networks of railway engineers in Europe, is able to deal with all technical problems one might encounter with rolling stock throughout its entire life cycle. Whether it calls for maintenance engineering, design engineering, expertise or trials, our teams and partners have mastered more than 90 railway-related domains, and they capitalise on the expertise of the SNCF group in matters relating to railway rolling stock.

MASTERIS defines itself as a serious alternative compared to typical offers of manufacturers and equipment suppliers in the sector. This means a guarantee of perfect integrity as far as our services are concerned.

Our clients' satisfaction lies at the heart of all our endeavours. This is the reason why our engineering teams are committed to accurate results, as they propose tailor-made solutions

with the aim of providing the best possible return on investment. It is by virtue of our simulation solutions and our experience in major industrial programmes in particular that we are now able to accompany you in your efforts at transformation of your rolling stock as part of facing the climate challenges of tomorrow. At the end of the day, maintenance professions are undergoing constant evolution; this is the reason why our teams today develop solutions for the processing of electronic obsolescence elements, ground-to-board communication solutions, and even predictive maintenance solutions (including ones rooted in artificial intelligence), designed to have a positive impact on the performance of our clients' rolling stocks in the future.

To choose MASTERIS is to choose a trusted partner dedicated to excellence.

Innovative, tried and tested engineering

At the heart of the largest network of railway engineers in Europe

The multidisciplinary teams of the MASTERIS Engineering Centre have mastery of more than 90 specialty railway-related domains. With this wide range of expertise, they can and do work on all types of rolling stock.

High speed trains

Electric and thermal railcars

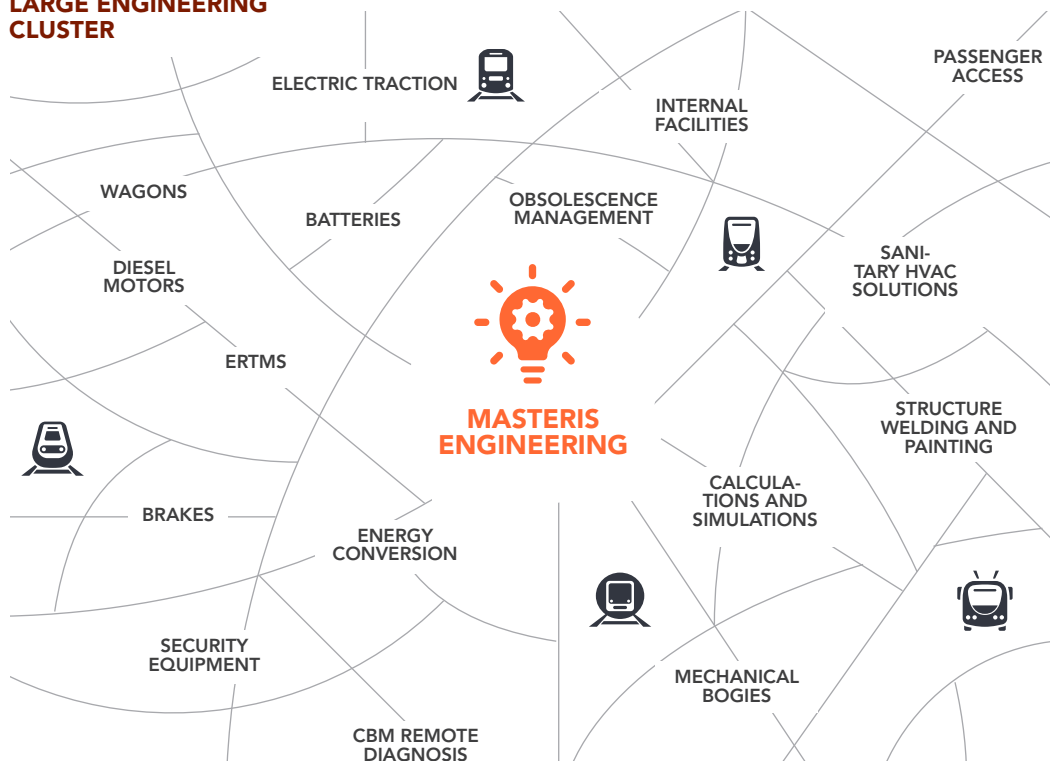
Locomotives and shunters

Tram trains and tramways

Cars

Wagons

MASTERIS IS PART OF A LARGE ENGINEERING CLUSTER



Railway maintenance and engineering solutions across the whole lifespan of the rolling stock

At MASTERIS, we understand that each phase of the life cycle of your rolling stock requires a specific kind of attention, with adapted solutions. Our offer of services is designed to address the 10 key needs of our clients, ranging from training to complex obsolescence management solutions. MASTERIS has established itself as a trusted partner which is ready to listen to and understand the specific needs of its clients so that they can provide them with tailor-made solutions.

1 ACQUIRING A NEW ROLLING STOCK

2 APPROVAL OF A ROLLING STOCK ON A NETWORK OR TRANSITION BETWEEN NETWORKS

3 OPERATING AND MAINTAINING YOUR ROLLING STOCK FLEET IN COMPLETE SECURITY

4 OPTIMISING OPERATION AND MAINTENANCE OF YOUR ROLLING STOCK

5 MONITORING THE LIFESPAN OF A FLEET OF EQUIPMENT

6 HAVING PARTS WITH WHICH TO KEEP ROLLING STOCK MAINTAINED

7 MAINTAINING / RESTORING POTENTIAL AT THE MID-LIFE POINT OF A ROLLING STOCK

8 TRANSFORMATION / MODERNISATION OF A ROLLING STOCK

9 REPAIRING A ROLLING STOCK (RA)

10 DISMANTLING A ROLLING STOCK

1 ACQUIRING A NEW ROLLING STOCK

The SNCF Group has significant experience in acquiring rolling stock, and has accompanied several clients, both in France and internationally, in their acquisition projects. Our range of services covers all the essential phases for guaranteeing that your acquisition project will be a successful one.

Services offered:

- + Advice, sizing and creation of a preliminary project
- + Execution of the purchasing procedure: from the drafting of the technical specifications to the drafting of the purchase contract, and offers counting, discussions, and technical and commercial negotiations
- + Management of the acquisition project up until the point of commissioning: support up until the point of commissioning, including support in receiving trains in your workshops and the provision of support during the warranty phase so as to ensure rapid resolution of any disputes between customer and manufacturer



Client reference

Akiem Network

Technical assistance acquiring 44 diesel locomotives (DE18-BB79000)

2 APPROVAL OF ROLLING STOCK ON A NETWORK OR TRANSITION BETWEEN NETWORKS

The approval of rolling stock is a crucial step in which the observation of a complex process is necessary. Whether you're seeking the approval of a whole new rolling stock or a particular sub-system, MASTERIS will accompany you in each stage of the approval process.

Services offered:

- + Preparation of the authorisation file
- + Sizing calculations, bench simulations and online investigation trials

A complete programme of bench and online approval trials, according to current European standards, can also be put forward in partnership with the Eurailtest testing subsidiary.

Clients' references

Siemens Mobility

Technical assistance for the approval of Vectron locomotives in France

Eurostar

Preparation of the authorisation file for the development of Eurostar E320 trains (ERTMS niv2 BL3)

3

OPERATE AND MAINTAIN YOUR ROLLING STOCK FLEET IN COMPLETE SECURITY

Efficient and secure management of rolling stock is essential for guaranteeing smooth and reliable railway operations. As a certified Entity in Charge of Maintenance as per European regulation 779/2019, MASTERIS offers a full range of maintenance services.

Services offered:

- + Services provided by an Entity in Charge of Maintenance: function support level 1 (maintenance management) and function support level 2 (maintenance development) as well as support services for these functions. Functions 3 and 4 are subcontracted to our parent company or to partners
- + Definition or redefinition of a suitable maintenance plan and all the elements of Integrated Logistics Support: documentations in connection with maintenance, tools, training programmes, etc.
- + Operational support: critical events expertise, fire events expertise, solving diesel-related pollution problems, optimisation of freight train compositions, studies and rolling stock lifting operations etc.

Client references

Venice Simplon Orient Express

Provision of ECM 1 and 2 functions in-house, sub-contracting of ECM 3 and 4 functions

Mesea

Provision of ECM 1, 2 and 3 functions in-house, sub-contracting of ECM 4 function

4

OPTIMISATION OF ONE'S OPERATION AND MAINTENANCE OF THEIR ROLLING STOCK

MASTERIS offers operation/maintenance staff a large range of services designed to optimise operation and maintenance of their rolling stock.

The diagnostic phase (which is essential) allows for the obtaining of an overall vision of the organisation and for identifying improvement opportunities and potential gains, and for outlining a tailor-made action plan.

Services offered:

- ✚ Optimising the availability of a fleet of machines
- ✚ Optimising reliability (FRACAS, growth plan, body failure expertise, EQS troubleshooting, etc.)
- ✚ Optimisation of maintenance costs
- ✚ Reducing the energy consumption of a rolling stock or an operational fleet
- ✚ Reducing the carbon emissions of a rolling stock or an operational fleet

Client references

Keolis Orléans

Distance monitoring of batteries on the Citadis tramway

Eurostar

Availability/reliability diagnosis on the E300 fleet



5 MONITORING THE LIFESPAN OF A FLEET OF MACHINES

The profile of electronics embedded in rolling stocks has evolved rapidly; this has brought about major improvements in terms of performance and comfort. However, these technologies now have a shorter life cycle. MASTERIS offers long-term solutions for obsolescence management of the relevant components.

Services offered:

- + Obsolescence management: establishment of framework contracts for long-term proactive management of electronic components
- + Solving targeted problems: specific intervention procedures to deal with occasional obsolescence of your equipment
- + Lifespan extension studies: in-depth analysis for identifying the maintenance and monitoring actions necessary for prolonging the lifespan of your fleet

Client references

Eurostar
Studies for prolonging lifespan

Akiem
Handling of obsolescence of locomotive traction electronics (Prima BB27000)

6 HOW TO KEEP PARTS RELATED TO ROLLING STOCK MAINTENANCE

Ensuring the on-time availability of parts in order to ensure uninterrupted operation is something essential. Engineering is an essential link in the supply chain, for the part it plays in the design or redesign of spare parts.

Services offered:

- + Parts characterisation trials
(sizes, materials, mechanical properties, etc.)
- + The writing of technical specifications when making purchases

Client reference

Various urban tramway operators/maintenance staff members
Despecialisation of brake component parts, despecialisation of passenger access door mechanism parts

7

MAINTAINANCE / RESTORING MID-LIFE POTENTIAL OF ROLLING STOCKS

MASTERIS has a specific expertise in the field of maintaining the mid-life potential of rolling stocks – such efforts are carried out mainly in the industrial technical centres of the SNCF Group. Our engineering approaches integrate all the skills necessary for guaranteeing high quality maintenance, and they are compliant with the strictest standards.

Services offered:

- ✚ Preparation of the programme: support is provided to clients from the preparation phase, with consideration of the necessary skills and substance preparation
- ✚ Project management assistance: assistance in the management and supervision of maintenance projects
- ✚ Project management: the provision of support in the execution of mid-life maintenance work, from planning to execution

Client references

Eurotunnel

Mid-life expertise with Brush locomotives

SNCF Voyageurs, the regions of France, CFL

Mid-life operations with AGC trains and TER2Nng (OPTER programme)



8 TRANSFORMING/MODERNISING A ROLLING STOCK

Whether it be in response to technological or regulatory developments, our engineers are masters in all kinds of projects, from the design stages right up to the submission of an authorisation dossier to the relevant security authorities.

Services offered:

- ✚ Design stages: analysis and design of the necessary technological or regulatory developments
- ✚ Detailed studies and validation programme
- ✚ Authorisation dossier: the compilation of the dossiers and the submission of them to the appropriate security authorities

Technological solutions:

- ✚ S.DOT: on-board and off-board IT solutions, which integrates such functions as on-ground/on-board communication, WiFi, passenger counting and information, a frontal camera, and much more. S.DOT offers a competitive solution focussed on obsolescence management throughout the full lifespan of the rolling stock
- ✚ MasterPAC: an innovative solution aimed at reducing the electricity consumption of air conditioning units, combined with a change of refrigerant for the sake of diminishing environmental impact

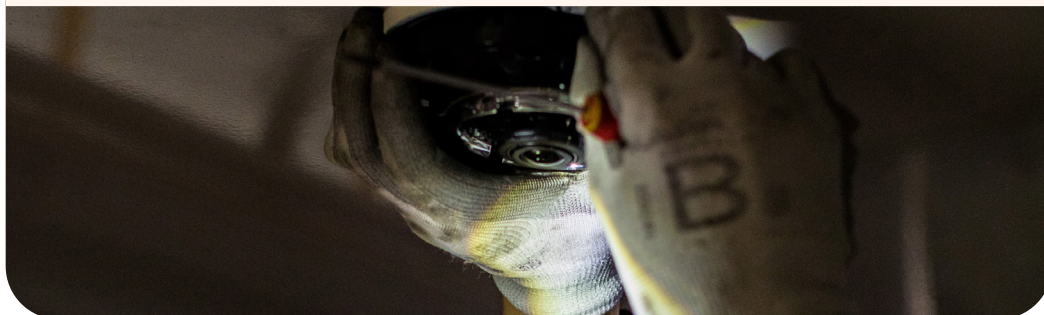
Security Equipment:

Our engineers have in-depth experience in the integration of on-board safety equipment, on both a national level (KVB, TVM) and an international one (ERTMS, Radio); such experience allows them to manage a wide range of development projects.

Client references

Eurostar
Integration of ERTMS in E300 trains

SNCF Voyageurs, the regions of France
Integration of the S.DOT system in AGC trains



9

REPAIRING A ROLLING STOCK (RA)

In the event of an accident, we will send out our engineers to carry out the work necessary for evaluating the damage that has taken place and establishing a repair estimate.

Services offered:

- + Repairing a rolling stock with AMOA: expertise of machines, set arrangements or parts, defining reparation consistency, obsolescence management
- + Drafting of the repair procedure as part of the outlining of the industrial operation method



Client reference

Keolis Bordeaux

Expertise with damaged Citadis trains

10

DISMANTLING A ROLLING STOCK

MASTERIS will take charge of the management of the dismantling of your fleet.

Services offered:

- + Account of the materials, components and items (recoverable or recyclable)
- + Asbestos removal management
- + Organisation of the industrial programme and sub-contracting management

Client reference

Keolis Nancy

Assistance in the dismantling of TVR tramway trains

Antoine MOUCHART

+33 (0)6 22 63 90 90

antoine.mouchart@masteris.com

